

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listing, of claims in the application:

Listing of Claims:

Claims 1-46 (canceled) without prejudice

Claim 47. (New) An isolated polynucleotide sequence comprising:

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- (a) a nucleotide sequence of SEQ ID NO: 1;
 - (b) a nucleotide sequence of SEQ ID NO: 4;
 - (c) a nucleotide sequence encoding a UDP-glucose binding domain;
 - (d) a sequence conservative variant of (a), (b), or (c); or
 - (e) a truncated nucleotide sequence of (a), (b), or (c) encoding a functional domain of cellulose synthase.

Claim 48. (New) The polynucleotide as set forth in claim 47 wherein the polynucleotide is operatively linked to a polynucleotide of SEQ ID NO: 3, or a functional fragment thereof.

Claim 49. (New) A vector comprising a polynucleotide as set forth in claim 47.

Claim 50. (New) A transgenic plant comprising a polynucleotide as set forth in claim 47.

Claim 51. (New) An isolated polynucleotide sequence comprising a cellulose synthase promoter, a sequence conservative variant thereof, or a functional fragment thereof which binds to a transcription factor in a plant cell.

Claim 52. (New) The polynucleotide as set forth in claim 51 wherein the promoter is SEQ ID NO: 3, a sequence conservative variant thereof, or a functional fragment thereof which binds to a transcription factor in a plant cell.

Claim 53. (New) The polynucleotide as set forth in claim 52 wherein the plant cell is a tree.

Claim 54. (New) The polynucleotide as set forth in claim 51 wherein the polynucleotide is a stress-inducible promoter.

Claim 55. (New) The polynucleotide as set forth in claim 51 wherein the cellulose synthase promoter, the sequence conservative variant thereof, or the functional fragment thereof comprises an MSRE.

Claim 56. (New) The polynucleotide as set forth in claim 55 wherein the MSRE is a positive MSRE, a negative MSRE, or a combination thereof.

Claim 57. (New) A vector comprising a promoter, a variant, or a fragment thereof as set forth in claim 51.

9.5 Claim 58. (New) The vector as set forth in claim 57, wherein the promoter, variant, or fragment thereof is operatively linked to a polynucleotide encoding cellulose synthase, a UDP-glucose binding domain, or a polynucleotide encoding a polypeptide other than cellulose synthase.

Claim 59. (New) A transgenic plant comprising a promoter, a variant, or a fragment thereof as set forth in claim 51.

Claim 60. (New) A transgenic tree comprising a promoter, a variant, or a fragment thereof as set forth in claim 51.

Claim 61. (New) An isolated and purified polypeptide comprising:

- (a) an amino acid sequence of SEQ ID NO:2;
- (b) an amino acid sequence of SEQ ID NO:5,
- (c) an amino acid sequence comprising 75% similarity to (a) or (b);
- (d) an amino acid sequence comprising a UDP-glucose binding domain exhibiting cellulose synthase functional activity independent of other portions of the cellulose synthase polypeptide; or
- (e) a function-conservative variant of (a), (b), or (d).

Claim 62. (New) An isolated polypeptide comprising a UDP-glucose catalytic subunit of cellulose synthase wherein the UDP-glucose catalytic subunit catalyzes the biosynthesis of cellulose independent of other portions of the cellulose synthase polypeptide.

Claim 63. (New) The polypeptide as set forth in claim 62 wherein the catalytic subunit is located between the second and third transmembrane region of cellulose synthase.

Claim 64. (New) The polypeptide as set forth in claim 62 wherein the catalytic subunit comprises a conserved sequence, wherein the sequence is QVLRW.

Claim 65. (New) A plant comprising the polypeptide as set forth in claim 62.

Claim 66. (New) A tree comprising the polypeptide as set forth in claim 62.

Claim 67. (New) A isolated polynucleotide encoding a polypeptide comprising:

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- (a) an amino acid sequence of SEQ ID NO:2;
 - (b) an amino acid sequence of SEQ ID NO:5,
 - (c) an amino acid sequence comprising 75% similarity to (a) or (b);
 - (d) an amino acid sequence comprising a UDP-glucose binding domain exhibiting cellulose synthase functional activity independent of other portions of the cellulose synthase polypeptide; or
 - (e) a function-conservative variant of (a), (b), or (d).

Claim 68. (New) A method of altering a characteristic of a plant comprising incorporating into the genome of the plant a nucleotide sequence encoding cellulose synthase, such that when the nucleotide sequence is expressed in the plant, the characteristic of the plant is altered, wherein the characteristic includes at least one of altered growth, altered cellulose content, altered lignin content, and altered strength of juvenile wood and fiber, and combinations thereof compared to a control plant that is not transformed with the nucleotide sequence.

Claim 69. (New) The method as set forth in claim 68 wherein the nucleotide sequence is in the anti-sense orientation.

Claim 70. (New) The method as set forth in claim 68 wherein the nucleotide sequence is in the sense orientation.

Claim 71. (New) The method as set forth in claim 68 wherein the nucleotide sequence is heterologous.

Claim 72. (New) The method as set forth in claim 68 wherein the nucleotide sequence is homologous.

Claim 73. (New) The method as set forth in claim 68 wherein the nucleotide sequence comprises:

- (a) a nucleotide sequence of SEQ ID NO: 1;
- (b) a nucleotide sequence of SEQ ID NO: 4;
- (c) a nucleotide sequence encoding a UDP-glucose binding domain;
- (d) a sequence conservative variant of (a), (b), or (c); or
- (e) a truncated nucleotide sequence of (a), (b), or (c) encoding a functional domain of cellulose synthase.

98 Claim 74. (New) The method as set forth in claim 68 wherein the plant is a tree.

cont. Claim 75. (New) The method as set forth in claim 74 wherein the tree is an angiosperm.

Claim 76. (New) The method as set forth in claim 74 wherein the tree is a gymnosperm.

• Claim 77. (New) The method as set forth in claim 68 wherein the altered growth is accelerated growth.

• Claim 78. (New) The method as set forth in claim 68 wherein the altered cellulose content is increased cellulose content or an increased ratio of cellulose to lignin in a cell.

• Claim 79. (New) The method as set forth in claim 78 wherein the cellulose is characterized by an increase in crystalline content.

Claim 80. (New) The method as set forth in claim 68 wherein the altered lignin content is decreased lignin content or a decreased ratio of lignin to cellulose in a cell.

Claim 81. (New) The method as set forth in claim 68 wherein the altered strength is improved mechanical strength.

Claim 82. (New) The method as set forth in claim 68 wherein the nucleotide sequence encodes a polypeptide comprising:

- (a) the amino acid sequence of SEQ ID NO:2;
- (b) the amino acid sequence of SEQ ID NO:5,
- (c) an amino acid sequence comprising 75% similarity to (a) or (b);

- (d) an amino acid sequence comprising a UDP-glucose binding domain exhibiting cellulose synthase functional activity independent of other portions of the cellulose synthase polypeptide; or
- (e) a function conservative variant of (a), (b), or (d).

Claim 83. (New) The method as set forth in claim 68 wherein the nucleotide sequence is operatively linked to a promoter.

Claim 84. (New) The method as set forth in claim 83 wherein the promoter is a plant promoter, or a transcription factor binding domain thereof.

Claim 85. (New) The method as set forth in claim 83 wherein the promoter is selected from constitutive promoters, tissue-specific promoters and developmental-specific plant promoters.

Claim 86. (New) The method as set forth in claim 83 wherein the promoter is Cauliflower Mosaic Virus 35S, 4CL, cellulose synthase promoter, *PtCelAP* or terminal flower promoter.

Claim 87. (New) A plant produced by the method as set forth in claim 68.

Claim 88. (New) A method of causing stress-induced gene expression in a plant cell comprising delivering into the cell a vector comprising a cellulose synthase promoter operatively linked to a gene, wherein the gene is expressed upon a mechanical stress to the plant.

Claim 89. (New) A method of determining a positive mechanical stress responsive element (MSRE) in a cellulose synthase promoter comprising:

- (i) introducing into a plant a cellulose synthase promoter that has a portion deleted, the cellulose synthase promoter operatively linked to a polynucleotide encoding a reporter, and
- (ii) detecting a decrease in the amount of reporter in the plant after inducing a stress to the plant.

Claim 90. (New) A method of determining a negative MSRE in a cellulose synthase promoter comprising:

- (i) introducing into a plant a cellulose synthase promoter that has a portion deleted, the cellulose synthase promoter operatively linked to a reporter gene, and
- (ii) detecting an increase in the amount of reporter in the plant after inducing a stress to the plant.

Claim 91. (New) A method of increasing expression of a cellulose synthase in a plant comprising delivering into the plant a cDNA encoding a protein that binds to a positive MSRE of a cellulose synthase promoter wherein the binding to the positive MSRE results in expression of a cellulose synthase, resulting in increased expression of cellulose in the plant.

Claim 92. (New) A method as set forth in claim 91 wherein the plant is a tree.

Claim 93. (New) A plant produced by the method as set forth in claim 91.

Claim 94. (New) A tree produced by the method as set forth in claim 92.

Claim 95. (New) A method of reducing expression of a cellulose synthase in a plant comprising delivering into the plant a cDNA in an antisense orientation, the cDNA in a sense orientation encoding protein that binds to a positive MSRE and results in expression of a cellulose synthase.

Claim 96. (New) A plant produced by the method as set forth in claim 95.

Claim 97. (New) A method as set forth in claim 95 wherein the plant is a tree.

Claim 98. (New) A tree produced by the method as set forth in claim 97.

Claim 99. (New) A method of increasing cellulose biosynthesis in a plant comprising delivering into the plant a cDNA encoding a protein that binds to a positive MSRE of a cellulose synthase promoter, wherein binding of the protein to the positive MSRE results in expression of a cellulose synthase.

Claim 100. (New) A plant produced by the method as set forth in claim 99.

Claim 101. (New) A method as set forth in claim 99 wherein the plant is a tree.

Claim 102. (New) A tree produced by the method as set forth in claim 101.

Claim 103. (New) A method of reducing cellulose biosynthesis in a plant comprising delivering into the plant a cDNA in an antisense orientation, the cDNA in a sense orientation encoding protein that binds to a positive MSRE of a cellulose synthase promoter.

Claim 104. (New) A plant produced by the method as set forth in claim 103.

Claim 105. (New) A method as set forth in claim 103 wherein the plant is a tree.

Claim 106. (New) A tree produced by the method as set forth in claim 105.

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Claim 107. (New) A method of altering a characteristic of a plant comprising incorporating into the genome of the plant a nucleotide sequence encoding cellulose synthase, a nucleotide sequence encoding a UDP-glucose binding domain, or a non-cellulose synthase-encoding nucleotide sequence, wherein the nucleotide sequence is operatively linked to a cellulose synthase promoter comprising a mechanical stress regulatory element (MSRE), such that in response to stress, a transcription factor contacts a MSRE nucleotide sequence of the cellulose synthase promoter, and such that when the nucleotide sequence is expressed in the plant, the characteristic of the plant is altered, wherein the characteristic includes at least one of altered growth, altered cellulose content, altered lignin content, and altered strength of juvenile wood and fiber, and combinations thereof compared to a control plant that is not transformed with the nucleotide sequence.

Claim 108. (New) The method as set forth in claim 107 wherein the MSRE is a positive MSRE.

Claim 109. (New) The method as set forth in claim 108 wherein the altered characteristic includes at least one of accelerated growth, increased cellulose content, decreased lignin content, and improved strength of juvenile wood and fiber, and a combination thereof.

Claim 110. (New) The method as set forth in claim 108 wherein the altered characteristic is accelerated growth.

Claim 111. (New) The method as set forth in claim 108 wherein the altered characteristic is increased cellulose content.

Claim 112. (New) The method as set forth in claim 108 wherein the altered characteristic is decreased lignin content.

Claim 113. (New) The method as set forth in claim 108 wherein the altered characteristic is improved strength of juvenile wood and fiber.

Claim 114. (New) The method as set forth in claim 107 wherein the MSRE is a negative MSRE.

Claim 115. (New) The method as set forth in claim 114, wherein the altered characteristic includes at least one of reduced growth, decreased cellulose content and increased lignin content, and a combination thereof.

Claim 116. (New) The method as set forth in claim 114 wherein the altered characteristic is reduced growth

Claim 117. (New) The method as set forth in claim 114 wherein the altered characteristic is decreased cellulose content.

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Claim 118. (New) The method as set forth in claim 114 wherein the altered characteristic is increased lignin content.

Claim 119. (New) A plant produced by the method as set forth in claim 107.

Claim 120. (New) A method as set forth in claim 107 wherein the plant is a tree.

Claim 121. (New) A tree produced by the method as set forth in claim 120.

Claim 122. (New) A method of regulating cellulose synthase expression in a plant comprising delivering into the plant (a) a cDNA encoding a polypeptide which is a positive MSRE of a cellulose synthase promoter; or (b) a cDNA in an antisense orientation of the cDNA of (a), in amount and under conditions effective to allow at least a portion of the plant's cells to take up the cDNA.

Claim 123. (New) A plant produced by the method as set forth in claim 122.

Claim 124. (New) A method as set forth in claim 122 wherein the plant is a tree.

Claim 125. (New) A tree produced by the method as set forth in claim 124.

Claim 126. (New) A method of altering a characteristic of a plant comprising the step of incorporating into the genome of the plant a nucleotide sequence encoding a UDP-glucose

catalytic subunit, such that when the nucleotide sequence is expressed in the plant, the characteristic of the plant is altered, wherein the characteristic includes at least one of accelerated plant growth, increased cellulose content, decreased lignin content, and improved strength of juvenile wood and fiber, and combinations thereof compared to a control plant that is not transformed with the nucleotide sequence.

Claim 127. (New) The method as set forth in claim 126 wherein the catalytic s subunit comprises a conserved sequence, wherein the sequence is QVLRW.

Claim 128. (New) The method as set forth in claim 126 wherein the altered characteristic is accelerated growth.

Claim 129. (New) The method as set forth in claim 126 wherein the altered characteristic is increased cellulose content.

95 Claim 130. (New) The method as set forth in claim 126 wherein the altered characteristic is decreased lignin content.

Claim 131. (New) The method as set forth in claim 126 wherein the altered characteristic is improved strength of juvenile wood and fiber.

Claim 132. (New) A plant produced by the method as set forth in claim 126.

Claim 133. (New) A method as set forth in claim 126 wherein the plant is a tree.

Claim 134. (New) A tree produced by the method as set forth in claim 133.

Claim 135. (New) A method of altering a characteristic of a plant comprising the step of incorporating into the genome of the plant a cellulose synthase promoter operatively linked to a nucleotide sequence, such that a negative MSRE of the cellulose synthase promoter has been modified, deleted, or blocked, and such that when the nucleotide sequence is expressed in the plant, the characteristic of the plant is altered, wherein the characteristic includes at least one of accelerated growth, increased cellulose content, decreased lignin content, and improved strength of juvenile wood and fiber, and combinations thereof compared to a control plant that is not transformed with the nucleotide sequence.

Claim 136. (New) The method as set forth in claim 135 wherein the altered characteristic is accelerated growth.

Claim 137. (New) The method as set forth in claim 135 wherein the altered characteristic is increased cellulose content.

Claim 138. (New) The method as set forth in claim 135 wherein the altered characteristic is decreased lignin content.

Claim 139. (New) The method as set forth in claim 135 wherein the altered characteristic is improved strength of juvenile wood and fiber.

Claim 140. (New) A plant produced by the method as set forth in claim 135.

Claim 141. (New) A method as set forth in claim 135 wherein the plant is a tree.

Claim 142. (New) A tree produced by the method as set forth in claim 141.

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Claim 143. (New) A method of altering a characteristic of a plant comprising the step of incorporating into the genome of the plant a cellulose synthase promoter operatively linked to a nucleotide sequence, such that a positive MSRE of the cellulose synthase promoter has been modified, deleted, or blocked, and such that when the nucleotide sequence is expressed in the plant, the characteristic of the plant is altered, wherein the characteristic includes at least one of decreased cellulose content, and increased lignin content, and combinations thereof compared to a control plant that is not transformed with the nucleotide sequence.

Claim 144. (New) The method as set forth in claim 143 wherein the altered characteristic is decreased cellulose content.

Claim 145. (New) The method as set forth in claim 143 wherein the altered characteristic is increased lignin content.

Claim 146. (New) A plant produced by the method as set forth in claim 143.

Claim 147. (New) A method as set forth in claim 143 wherein the plant is a tree.

Claim 148. (New) A tree produced by the method as set forth in claim 147.

Claim 149. (New) A plant having a characteristic genetically altered through incorporation into the genome of the plant a nucleotide sequence encoding cellulose synthase, such that when the nucleotide sequence is expressed in the plant, the characteristic of the plant is altered, wherein the characteristic includes at least one of altered growth,

altered lignin content, altered cellulose content, and altered strength of juvenile wood and fiber, and combinations thereof compared to a control plant that is not transformed with the nucleotide sequence.

Claim 150. (New) The plant as set forth in claim 149 wherein the nucleotide sequence is in the anti-sense orientation.

Claim 151. (New) The plant as set forth in claim 149 wherein the nucleotide sequence is in the sense orientation.

Claim 152. (New) The plant as set forth in claim 149 wherein the nucleotide sequence is heterologous.

Claim 153. (New) The plant as set forth in claim 149 wherein the nucleotide sequence is homologous.

Claim 154. (New) The plant as set forth in claim 149 wherein the nucleotide sequence comprises:

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- (a) a nucleotide sequence of SEQ ID NO: 1;
 - (b) a nucleotide sequence of SEQ ID NO: 4;
 - (c) a nucleotide sequence encoding a UDP-glucose binding domain;
 - (d) a sequence conservative variant of (a), (b), or (c); or
 - (e) a truncated nucleotide sequence of (a), (b), or (c) encoding a functional domain of cellulose synthase.

Claim 155. (New) The plant as set forth in claim 149 wherein the plant is a tree.

Claim 156. (New) The plant as set forth in claim 155 wherein the tree is an angiosperm.

Claim 157. (New) The plant as set forth in claim 155 wherein the tree is a gymnosperm.

Claim 158. (New) The plant as set forth in claim 149 wherein the altered growth is accelerated growth.

Claim 159. (New) The plant as set forth in claim 149 wherein the altered cellulose content is increased cellulose content or an increased ratio of cellulose to lignin in cells.

Claim 160. (New) The plant as set forth in claim 159 wherein the cellulose is characterized by an increase in crystalline content.

Claim 161. (New) The plant as set forth in claim 149 wherein the altered lignin content is decreased lignin content or a decreased ratio of lignin to cellulose in the cells.

Claim 162. (New) The plant as set forth in claim 149 wherein the nucleotide sequence encodes a polypeptide comprising:

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- (a) the amino acid sequence of SEQ ID NO:2;
 - (b) the amino acid sequence of SEQ ID NO:5,
 - (c) an amino acid sequence comprising 75% similarity to (a) or (b);
 - (d) an amino acid sequence comprising a UDP-glucose binding domain exhibiting Cellulose synthase functional activity independent of other portions of the Cellulose synthase polypeptide; or
 - (e) a function-conservative variant of (a), (b), or (d).

Claim 163. (New) The plant as set forth in claim 149 wherein the nucleotide sequence is operatively linked to a promoter.

Claim 164. (New) The plant as set forth in claim 163 wherein the promoter is a plant promoter, or a transcription factor binding domain thereof.

Claim 165. (New) The plant as set forth in claim 163 wherein the promoter is selected from constitutive promoters, tissue-specific promoters and developmental-specific plant promoters.

Claim 166. (New) The plant as set forth in claim 163 wherein the promoter is Cauliflower Mosaic Virus 35S, 4CL, cellulose synthase promoter, *PtCelAP* or terminal flower promoter.
